

### REMARKS

Claims 1-56 and Claims 67-76 are canceled. Claims 93-99 and 121 have been withdrawn. Thus, claims 57-66 and 77-92 and 100-120 are pending in the application.

### NON-OBVIOUSNESS UNDER 35 U.S.C. §103(A)

Independent claims 57, 77, and 100 and the dependent claims which depend from the respective independent claims are not obviousness because the reference, individually or combined, do not disclose methods of using a mixed metal oxide having an X-ray diffraction pattern displaying at least a reflection at a two theta peak position at about 43 degrees and about 62 degrees in general and not in an FCC unit.

The Office Action rejected Claims 1-92 and 100-120 under 35 U.S.C. 103(a) as allegedly unpatentable over Vierheilig U.S. 6,028,023 ('023 reference) in view of Poirier (U.S. Patent 5,951,851).

To establish a prima facie case of obviousness, according to MPEP and past and recent case law, it is and still remains *necessary for* the Examiner to demonstrate a motivation to modify, some reason that would lead **one of ordinary skill in the art modify a known prior art**. Takeda Chemical Industries, Ltd. v. Alphapharm Pty., Ltd. 06-1329 Fed. Cir. 2007. Allegations of 'obvious to try' are not sufficient if "the situation presented was not one with a **finite number of identified, predictable solutions.**" Id. Thus, an Examiner must necessarily identify some reason that would have led one of ordinary skill in the art to make the modification.

In this case, Applicants respectfully submit that independent claims 57, 77, and 100 and the claims dependent thereon are not obvious because the references '023 and Poirier, either individually or combined, do not disclose methods of **using a mixed metal oxide** having an X-ray diffraction pattern displaying at least a reflection at a two theta peak position at about 43 degrees and about 62 degrees in general and do not disclose **using the mixed metal oxide** in an FCC unit to reduce the concentration of sulfur in gasoline. The references Poirier and '023,

either individually or combined, only disclose using an hydrotalcite like compound (HTL i.e. also referred as and known to one of ordinary skill in the art as '**mixed metal hydroxide**' as shown by but not limited to the cited '023 reference. Col 1 lines 63-Col 2 line 17) and do not disclose method of using a mixed metal oxide to reduce the concentration of sulfur in gasoline. Poirier does not even disclose the mixed metal oxide having an X-ray diffraction pattern displaying at least a reflection at a two theta peak position at about 43 degrees and about 62 degrees.

An applicant is allowed to be his own lexicographer and has chosen to refer to the compound having an X-ray diffraction pattern displaying at least a reflection at a two theta peak position at about 43 degrees and about 62 degrees by the lexicon i.e. name of **mixed metal oxide** (also referred as "precursor") and has defined the mixed metal oxide with reasonable efforts in several places in this application as filed, such as but not limited to paragraph 10, 32, 33, 35, 37-40, 45-46, 50, 51, and 52-57 and also distinguished the mixed metal oxide from a hydrotalcite like compound (HTL i.e. **mixed metal hydroxide**.)

[0010] "The invention also provides methods for reducing sulfur in gasoline by adding gasoline sulfur reduction additives comprising **mixed metal oxide compounds, also referred to as precursors of hydrotalcite like compounds**, to an FCC unit"

Furthermore, this application as filed includes and refers to mixed metal oxide described in U.S. Patent No. 6,028,023:

[0032] Methods for making these mixed metal oxide compounds are described in U.S. Patent Nos. 6,028,023 and 6,479,421, the disclosures of which are incorporated by reference herein in their entireties.

Moreover, several Office Actions even repeated admit that the references, individually or combined, disclose using HTL, not the mixed metal oxide, in an FCC unit. [It should also be noted that Office Action even admits that "Vierheilig '023 **does not disclose** using the hydrotalcite-like compound in an FCC catalyst to remove sulfur from petroleum." (page 4 Office Action).] The references themselves also disclose using hydrotalcite-like compound in an FCC unit, and do not disclose using a mixed metal oxide in an FCC unit. For example, the '023 discloses using HTL (i.e. mixed metal hydroxide) in an FCC unit and distinguishes HTL from

the mixed metal oxide (i.e. precursor) while remaining silent regarding method of using the mixed metal oxide such as but not limited to:

"Applicant's overall invention is primarily based upon a two step "activation" procedure that is generally comprised of heat treating and then hydrating certain hereinafter described **hydrotalcite-producing, precursor** compounds"

"Applicant's invention has two general embodiments. The first embodiment is a method for producing HTL compounds (e.g., anionic clay compounds, hydrotalcite per se, and various hydrotalcite-like compounds) from compounds that do not possess the structural characteristics of HTL compounds. ....

"Temperatures at the upper end of applicant's 300°-850°C. range, such as temperatures ranging from about 700°-850°C., are less preferred since various less desirable phases (hereinafter more fully described) may result from heating **applicant's precursor, synthesis reaction products to such levels**. The formation of these less desirable phases may diminish the precursor material's potential to form maximum amounts of the HTL-containing phases that are the object of applicant's processes."

(Col. 7 line 57- Col. 9 line 4)

"Because the HTL compounds of this patent disclosure are harder than HTL compounds made by prior art processes, they present a method whereby the useful life of a catalyst or sorbent system (such as those employed in FCC units or fixed bed units) can be extended. This extension of a catalyst's (or sorbent's) useful life will take place when the HTL compounds of this patent disclosure are used in their own right, e.g., as hydrocarbon cracking or forming catalysts, SOx sorbents, etc., or when these HTL compounds are used as binders, matrices, supports, or carriers for other catalytically active materials ..."

( Col. 15 lines 19-27)

Poirier fails to provide the missing motivation as Poirier does not even disclose the mixed metal oxide having an X-ray diffraction pattern displaying at least a reflection at a two theta peak position at about 43 degrees and about 62 degrees.

Mixed metal oxide has multiple unexpected benefits and characteristics which differ from an HTL or calcined HTL, thereby showing that the mixed metal oxide is not the same composition as HTL or calcined HTL.

X-ray diffraction pattern

'023 reference states:

"FIG. 5 shows the changes in crystal structure at various steps in applicant's "activation" process. The top two curves in this plot (respectively labeled "2Mg/1Al Mixed metal oxide before heat aging" and "2Mg/1Al Mixed metal oxide after heat aging") already have been discussed as part of the previous discussion of FIGS. 1 to 4. The trace in FIG. 5 labeled "heat treated" is representative of the observed phases of HTL structures following Step 1 of applicant's activation process. The trace labeled "heat treat+hydrate (activated HTL)" depicts the results of Step 2 of applicant's activation process. Clearly, an HTL structure has been created. This is evidenced by the presence of all major peaks of an HTL compound, including peaks at about 11.271 degrees, 22.700 degrees and 34.358 degrees manifesting their presence. It also should be noted that FIG. 5 includes the effects of the  $\text{CeO}_{2.2}$  component that was added during the synthesis reaction and whose most prominent peaks manifest themselves at 28.555 degrees, 47.479 degrees and 56.335 degrees." (Col. 19 line 26-45)

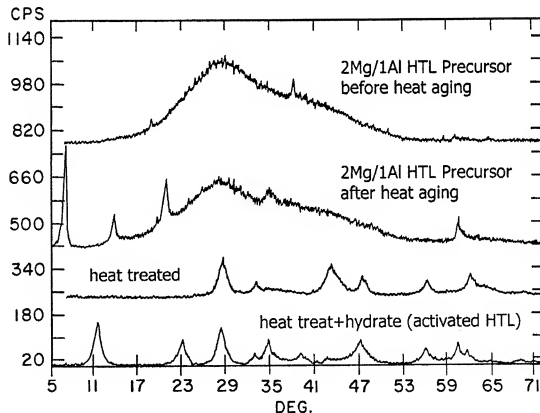


Fig. 5 of '023 reference shows that the 3<sup>rd</sup> graph from top labeled 'heat treated' is the x-ray diffraction (XRD) pattern of the mixed metal oxide having an X-ray diffraction pattern displaying at least a reflection at a two theta peak position at about 43 degrees while the 4<sup>th</sup> graph labeled "heat treat+hydrate (activated HTL)" is the XRD of the resulting HTL structure, wherein the 3<sup>rd</sup> and 4<sup>th</sup> graphs are not the same. Thus, '023 reference Fig. 5 shows that the **mixed metal oxide** has an XRD pattern which differs from the resulting HTL (i.e. mixed metal hydroxide) or the XRD graphs 1<sup>st</sup> and 2<sup>nd</sup>. Thus, HTL and mixed metal oxide are not the same compositions.

The application as filed also shows that the mixed metal oxide has other different characteristics from an HTL or calcined HTL, such as degree of gasoline sulfur reduction, product yield, and yield shift, and hence are not the same composition. Each characteristic independently refute that the present claims are obvious. For example, gasoline sulfur reduction of using Example 1 additive B which is an embodiment of the methods of using mixed metal oxide or precursors of this invention, reduced gasoline sulfur (9.6) more than the collapsed HTL of additive A and C in example 1. Example 1 additive D is also an embodiment of using mixed metal oxide or precursor of this invention which reduced gasoline sulfur. Thus, embodiments of methods of using mixed metal oxides of the present invention are useful to reduce gasoline sulfur. Additionally, paragraph 67 of this application as filed provides further support that the mixed metal oxide has other different characteristics from an HTL or calcined HTL, such as product yield, and yield shift. Thus, the application as filed shows that mixed metal oxide has multiple different characteristics from an HTL or calcined HTL, such as, but not limited to, Attrition Index and ABD, X-ray diffraction pattern, degree of gasoline sulfur reduction, product yield, and yield shift.

Attrition Index and ABD

The mixed metal oxide has other multiple different characteristics from an HTL or calcined HTL, each characteristic which independently refute that the present claims are obvious. For example, TABLE IV and FIG. 5 in the '023 reference (Col. 22 line 47-55) shows that the mixed metal oxide has an attrition resistance and ABD that differs from an HTL:

TABLE IV

HTL Composition	Attrition Index (ASTM)	*ABD (g/cc)
2 Mg/1Al (Step 1 Activation)	3.9	0.39
2 Mg/1Al (Step 2 Activation)	0.54	0.96
5 Mg/1Al (Step 1 Activation)	15	0.36
5 Mg/1Al (Step 2 Activation)	0.65	0.75

\*Apparent Bulk Density

As shown in patent '023 Table IV, "2 Mg/1Al (Step 1 Activation)" line 1 with Attrition Index 3.9 and 0.39 is an embodiment of the mixed metal oxide, also referred as mixed metal oxide, in pending claims. The composition "2 Mg/1Al" (Step 2 Activation)" 2<sup>nd</sup> line with Attrition Index 0.54 and 0.96 ABD is an embodiment of HTL. The composition with "5 Mg/1Al (Step 1 Activation)" 3<sup>rd</sup> line with Attrition Index 15 and 0.36 ABD is another embodiment of the mixed metal oxide. The composition with "5 Mg/1Al (Step 2 Activation)" 4<sup>th</sup> line with Attrition Index 0.65 and 0.75 ABD is another embodiment of an HTL. Thus, '023 reference, with multiple examples, shows that the mixed metal oxide has a different Attrition Index and ABD than HTL, and hence are not the same compositions, each characteristic which independently refute that the present claims are anticipated or obvious.

TABLE V in the '023 reference shows:

Table V

HTL Composition	Attrition Index (ASTM)	*ABD (g/cc)
2 Mg/1Al (Step 1 Activation)	3.9	0.96
2 Mg/1Al (Step 2 Activation)	0.54	0.96
2 Mg/1Al (Additional heat to 732°C./hr.)	0.81	0.80

TABLE V in the '023 reference (Col. 22 line 47-55) shows that the mixed metal oxide has an attrition resistance and ABD that differs from a calcined HTL. The composition with "2 Mg/1Al" 3<sup>rd</sup> line with Attrition Index 0.81 and 0.80 ABD is an embodiment of a calcined HTL. Thus, '023 reference shows that the mixed metal oxide has a different Attrition Index and ABD than calcined HTL, and hence are not the same compositions, each characteristic which independently refute that the present claims are anticipated or obvious. Thus, '023 reference Tables IV and V shows that the mixed metal oxide has an Attrition Index and ABD that differs from an HTL and calcined HTL, and hence are not the same compositions.

Thus, '023 alone or in view of Poirier do not disclose *using a mixed metal oxide* in general and not in an FCC unit:

"Precursor" to a hydrotalcite like compound, also referred as mixed metal oxide compound, is not and cannot be the same composition as a HTL (i.e. mixed metal hydroxide) or calcined HTL based on multiple differing characteristics from an HTL or calcined HTL, such as X-ray diffraction pattern, degree of gasoline sulfur reduction, product yield, and yield shift, and Attrition Index and ABD. Each characteristic independently shows that the mixed metal oxide is not and cannot be the same composition as an HTL or calcined HTL.

'023 alone or in view of Poirier do not disclose *using a mixed metal oxide* in an FCC unit. Nor do '023 alone or in view of Poirier disclose using a mixed metal oxide in an FCC unit to reduce gasoline sulfur, etc. and Poirier does not even disclose the mixed metal oxide.

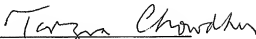
Thus, reducing gasoline sulfur emissions from a FCC unit or cracking unit with a precursor or mixed metal oxide compound is not and cannot be inherent or obvious because HTL and calcined HTL are different from a mixed metal oxide (as discussed above) and '023 does not disclose using a mixed metal oxide for such uses and hence the mixed metal oxide is not and cannot be in the FCC unit or cracking unit to necessarily, inherently or obviously reduce gasoline sulfur. In other words, reducing gasoline sulfur emissions from an FCC unit or cracking unit with a mixed metal oxide is not and cannot be inherent or obvious when the mixed metal oxide is not in the FCC unit or cracking unit and when the references do not suggest using the mixed metal oxide or as in **Poirier, does not even disclose the mixed metal oxide.** Thus, a new method for reducing gasoline sulfur with a mixed metal oxide is not inherent or obvious over '023 alone or in view of Poirier and is patentable because new method or use of a compound is patentable.

Consequently, Applicant respectfully submits that independent claims 57, 77, and 100 are not obvious. As current independent claims are allowable, all the dependent claims which depend from the respective independent claims are also allowable



Date: December 11, 2007

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